

LINCOLN LAKE  
Spencer County  
2005 Fish Management Report

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## EXECUTIVE SUMMARY

- A general lake survey was completed at Lincoln Lake on May 31 to June 1, 2005. An aquatic vegetation survey was also conducted on August 11.
- The Secchi disk reading was 9 ft and dissolved oxygen concentrations were adequate for fish survival to a depth of 14 ft. Submersed aquatic vegetation was found to a maximum depth of 11 ft. Naiad spp. dominated the vegetation population, followed by sago pondweed and chara.
- A total of 675 fish, representing 11 species and 1 hybrid, was collected during this survey. Bluegill ranked first by number, followed by largemouth bass, and redear sunfish.
- Bluegill have increased in density while maintaining a balanced population with fish reaching 6.0 in by age 4. Largemouth bass have sustained their density and growth. They are reaching 12.0 in by age 4. The gizzard shad population has not increased significantly since the 2003 survey. Gizzard shad are not yet negatively affecting the sport fishery.
- The Division of Fish and Wildlife should maintain the 14-in minimum size limit and five fish bag limit on largemouth bass and continue to stock 928 (16/acre), 8 to 12 in channel catfish every two years.

## INTRODUCTION

Lincoln Lake is a 58-acre impoundment located in Lincoln State Park. The lake was built in 1934 and its water level was increased 10 ft in 1944. Lincoln Lake is popular with park visitors and fishing pressure is thought to be moderate to heavy. Shoreline fishing is available around most of the lake. A concrete boat ramp exists for boat anglers. Boat motor use is restricted to electric motors only. Maps of the property are available on the Internet at [http://www.in.gov/dnr/parklake/properties/park\\_lincoln.html](http://www.in.gov/dnr/parklake/properties/park_lincoln.html). There is a \$4.00 daily gate fee or \$24.00 annual entrance permit and all boaters must purchase a daily launch permit for \$5.00 or an annual launch permit for \$20.00 (Indiana resident prices).

The lake's fishery is regulated by Indiana's standard length and bag limit restrictions. Prior fish management activities have consisted of the stocking of 735 triploid grass carp in 1993, annual aquatic herbicide applications, and biennial channel catfish stockings from 1975 through 1990 and 2003.

The 2001 fish management report documented the appearance of gizzard shad (Carnahan 2001). Also, growth for both largemouth bass and bluegill increased from the previous survey while catch rates for both species remained low. The low catch rates were attributed to warm water temperatures causing the fish to move to deeper water. The 2003 fish management survey showed little change in bass and bluegill catch rates (Doll 2004). With cooler water temperatures at the time of the survey, the low largemouth bass catch rate and absence of legal size bass was attributed to illegal harvest. At that time, the gizzard shad population had not increased significantly in relative abundance.

## METHODS

The current survey was conducted May 31 to June 1, 2005, as part of the Division of Fish and Wildlife (DFW) Work Plan 202478, to monitor bluegill, largemouth bass, and gizzard shad abundances. Some of the lake's physical and chemical characteristics were measured according to standard guidelines (Indiana DFW 2001). Submersed aquatic vegetation was sampled on August 11, 2005, using guidelines written by Pearson (2004). A global positioning system (GPS) device was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish sample sites.

Fish collection effort consisted of pulsed D.C. electrofishing the shoreline at night with two dippers for 0.75 h. Four experimental-mesh gill nets and two trap nets were also fished overnight. All fish collected were measured to the nearest 0.1 in TL. Average weights for fish by half-inch group for Fish Management District 7 were used to estimate the weight of all collected fish. Scale samples were taken from bluegill, largemouth bass, and redear sunfish for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) were calculated for bluegill and largemouth bass (Anderson and Neumann 1996). The bluegill fishing potential (BGFP) index was used to assess bluegill fishing quality (Ball and Tousignant 1996).

## RESULTS

At the time of the survey, Lincoln Lake was clear with a Secchi disk reading of 9 ft. Dissolved oxygen concentrations were adequate for fish survival to a depth of 14 ft. Submersed aquatic vegetation was found to a maximum depth of 11 ft. Naiad spp. dominated the vegetation population, followed by sago pondweed and chara. Leafy pondweed and waterthread pondweed were also found in low abundance.

A total of 675 fish, representing 11 species and 1 hybrid, was collected during this survey that weighed approximately 249.78 lbs. By number, bluegill ranked first, largemouth bass second, and redear sunfish third in the survey sample. By weight, gizzard shad ranked first followed by largemouth bass and channel catfish. Other species sampled were warmouth, yellow bullhead, black crappie, yellow perch, black bullhead, and grass carp. Two hybrid sunfish were also sampled.

A total of 401 bluegill was sampled that weighed an estimated 21.43 lbs. They ranged in length from 1.3 to 8.5 in. Relative abundance by number and weight was 59% and 9%, compared to 22% and 6% in 2003. The bluegill electrofishing catch rate was 530.7/h. Previous electrofishing catch rates were 254.8 (1995), 485.3 (1998), 57.3 (2001), and 69.3/h (2003). Gill net and trap net catch rates were 0.3 and 1.0/lift. In 2003, gill net and trap net catch rates were 0.5/ lift each. Growth was similar to 2003 and average when compared to the district average. Back-calculated lengths indicated bluegill reached 6 in (i.e. quality size) during their 4<sup>th</sup> year of growth. The bluegill PSD was 28. In 2003 the bluegill PSD was 67. The bluegill RSD7 and RSD8 were 19 and 5, and in 2003 they were 63 and 17. The BGFP index classified bluegill

fishing as “excellent” with a score of 29 out of a possible 40, compared to a score of 19 in 2003 (Table 1).

Eighty-five largemouth bass were sampled that weighed an estimated 36.76 lbs. They ranged in length from 3.4 to 14.7 in. Relative abundance by number and weight was 13% and 15% compared to 40% and 41% in 2003. The largemouth bass electrofishing catch rate was 108.0/h. Previous electrofishing catch rates were 153.2 (1995), 102.7 (1998), 86.7 (2001), and 125.3/h (2003). The gill net catch rate was 1.0/lift and no largemouth bass were collected in trap nets. Growth was similar to 2003 for all ages. When compared to the district average, age-2 bass are 1 in longer while other ages are average. Back-calculated lengths indicated largemouth bass reached 12 in (i.e. quality size) during their 4<sup>th</sup> year of growth. The largemouth bass PSD was 29 and RSD14 was 4. Previous PSDs were 4 (1995), 30 (1998), 15 (2001), and 10 (2003). The largemouth bass RSD14 was 1 in 2003.

A total of 80 redear sunfish was sampled that weighed an estimated 29.19 lbs. They ranged in length from 2.6 to 11.1 in. Relative abundance by both number and weight was 12% compared to 21% for both in 2003. The redear sunfish electrofishing catch rate was 72.0/h. In 2001 and 2003, the electrofishing catch rate was 10.7 and 56.0/h. The gill net and trap net catch rates were 1.3 and 10.5/lift. In 2003, the gill net and trap net catch rates were 1.5 and 2.0/lift. Redear sunfish growth has remained constant since 2003. Compared to the district average, growth for all age classes was average.

Forty-one gizzard shad were sampled that weighed an estimated 79.14 lbs. They ranged in length from 9.3 to 19.5 in. Relative abundance by number and weight was 6% and 32%, compared to 5% and 16% in 2003. In 2003, the gizzard shad electrofishing catch rate increased from 17.3 (2003) to 54.7/h.

Eleven channel catfish were sampled that weighed an estimated 36.07 lbs. They ranged in length from 12.2 to 30.8 in. Relative abundance by number and weight was 2% and 14%. The channel catfish electrofishing catch rate was 8.0/h and the gill net catch rate was 1.3/lift.

## DISCUSSION

Since the 2003 survey, the bluegill electrofishing catch rate increased 666%. Despite this increase, bluegill are maintaining a balanced population according to the PSD index. The primary contributor to the catch rate increase is a strong 2004 year class (Figure 1). Age-1

bluegill were collected at a rate of 361.3/h, as opposed to 33.3/h in 2003. This has resulted in an increase from 22% to 59% in the bluegill relative abundance by number. The decreased PSD is a product of more 3 to 6-in bluegill, primarily age-2 fish which are averaging 4.1 in (var = 0.34). Another decrease in PSD will likely occur in 2006, as the 2004 year-class will be in the 3 to 6-in length range. The 10 point increase in the BGFP index score is due to the 2004 year class. This year class has increased all the parameter scores resulting in the classification improvement. The individual scores ranged from 5 to 9. The successful 2004 year class has not negatively impacted growth. However, growth may slow as these individuals get larger and if the gizzard shad population expands.

Largemouth bass catch rates have changed very little since the 2003 survey. Stock density indices indicate the population is shifting toward larger fish. Even though the PSD remains below the recommended range, it has nearly tripled since 2003 and it is closest to the range suggested for a balanced population since 1998. Average growth, a balanced bluegill population, and an additional gizzard shad forage base will allow the largemouth bass population to maintain or improve its present status. The current largemouth bass 14-in minimum size limit and five fish bag limit should remain in place to ensure there are enough predators to prey on gizzard shad.

The gizzard shad relative abundance by number has stayed constant since 2003, while catch rates tripled. The absence of small gizzard shad at the time of the survey indicates spawning or survival of age-0 gizzard shad has been limited. Factors that have been shown to impact spawning and survival of age-0 gizzard shad include: water temperature and water level (Michaletz 1997), zooplankton size and abundance (Bremigan and Stein 1997), and macrophyte abundance (Michaletz and Bonneau 2005). Unseasonably cool springs would result in sporadically poor year classes of gizzard shad that would not suppress the population as a whole and Lincoln Lake does not experience yearly water level fluctuations. This would suggest that the zooplankton and macrophyte communities are the primary contributors to the suppressed gizzard shad population. If current watershed practices are adhered to and there is not a significant increase in the lake's nutrient load, gizzard shad are not likely to increase in density. Successful recruitment of the 2004 bluegill and largemouth bass year classes in addition to average growth for both species indicate gizzard shad are not yet affecting the sport fishery.

However, they may in the future if their population size increases. To monitor the gizzard shad population and any impacts on the sport fishery, Lincoln Lake should be resurveyed in 2008.

The channel catfish gill net catch rate of 1.3/lift indicates they are being utilized at Lincoln Lake. With the lake being located in a state park and having good shoreline access, the channel catfish stockings should continue.

#### RECOMMENDATIONS

- The DFW should maintain the 14-in minimum size limit and five fish bag limit on largemouth bass at Lincoln Lake.
- The DFW should continue to stock 928 (16/acre), 8-12 in channel catfish with the next stocking scheduled for 2005.
- Resurvey Lincoln Lake in 2008 to monitor gizzard shad, bluegill, and largemouth bass abundance.

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Table 1. Bluegill fishing potential index results  
1998, 2001, 2003, and 2005

Parameter	Score			
	1998	2001	2003	2005
Density	6	0	0	6
Growth	5	6	4	5
PSD	10	7	7	9
RSD8	6	0	8	9
Totals	27	13	19	29

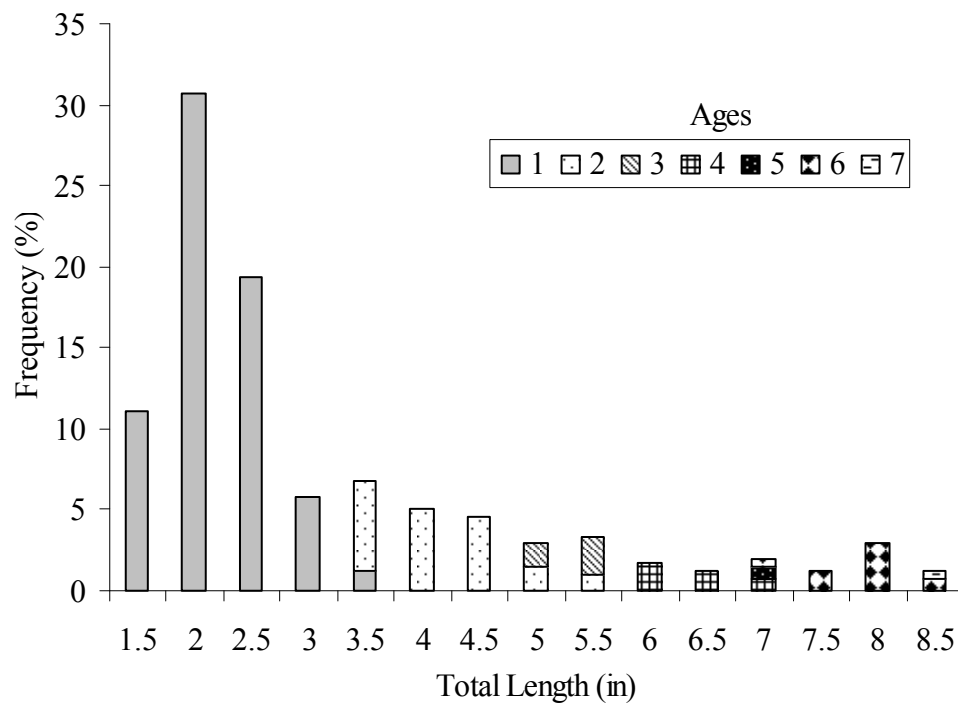


Figure 1. Lincoln Lake bluegill length frequency.

APPENDIX 1  
FISH MANAGEMENT SURVEY DATA